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Anxiety and Threat Perception Abnormalities in Normal Children

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The current study examined the relationship between childhood anxiety and threat perception abnormalities. Children (N = 105) were exposed to stories reflecting three types of anxiety: social anxiety, separation anxiety, and generalized anxiety. From children's reactions to the stories, a number of threat perception indices were derived. Children's level of anxiety was assessed by means of questionnaires and a structured diagnostic interview. Results indicated that high levels of anxiety, as measured by questionnaires and interview, were accompanied by a high frequency of threat perception, high ratings of threat, a high frequency of threatening interpretations, high levels of negative feelings and cognitions, and an early detection of threat. Furthermore, results seemed to suggest that threat perception abnormalities were mediated by children's general level of anxiety rather than by levels of specific anxiety symptoms.

KEY WORDS: information processing; perception of threat; anxiety; children.

INTRODUCTION

Research in anxious adults has provided convincing evidence for the presence of information processing biases toward threat. These biases are

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hypothesized to play a role in the maintenance of anxiety disorders (e.g., Eysenck, 1992). In the past 5 years or so, empirical studies on information processing abnormalities in anxious children have just begun to emerge (see for a review, Daleiden & Vasey, 1997). One type of cognitive abnormality that has received considerable research attention is *interpretation bias*. Interpretation bias refers to the phenomenon that anxious children display the tendency to interpret ambiguous situations more easily as threatening compared to non-anxious children.

Support for the existence of interpretation bias in anxious children comes from a study by Barrett, Rapee, Dadds, and Ryan (1996). In that study, anxiety disordered children, children with oppositional defiant disorder, and normal controls were presented with brief stories of ambiguous situations and asked about what was happening in each situation. Then, children were given two possible neutral outcomes and two possible threatening outcomes and asked which outcome was most likely. Results showed that both anxious and oppositional children more frequently interpreted ambiguous situations as threatening than normal controls. Interestingly, anxious children more often chose avoidant outcomes, whereas oppositional children more frequently chose aggressive outcomes. In a study of Hadwin, Frost, French, and Richards (1997), children low or high on trait anxiety were confronted with ambiguous homophones that had either a neutral or a threatening interpretation (e.g., dye versus die). High levels of trait anxiety were found to be positively related to threatening interpretations of homophones. Altogether, these and other findings (Chorpita, Albano, & Barlow, 1996; Bögels & Zigterman, in press) suggest that anxious children are more likely to interpret ambiguous situations in a threatening way.

In their review article, Daleiden and Vasey (1997) speculate about another information processing abnormality that may occur in anxious children. Briefly, these authors hypothesize that in anxious children "even very minor threat cues may readily trigger subsequent processing and consequently anxious responding. In essence, they may be acutely vigilant for signals of potential threat but, once they have encoded such a signal, they may quickly move through the interpretation stage and conclude that the situation is dangerous even though a search for further information would show it is not" (p. 411). Evidence for such a *threat perception bias* in anxious children was provided in a recent study by Muris, Merckelbach, and Damsma (in press). In that study, children ($N = 252$) were exposed to stories in which social situations were described. They were told that some of these stories were scary, i.e., these stories would have a bad end, whereas other stories were not scary, i.e., these stories would have a happy

end. Children were instructed to find out as quickly as possible whether the pertinent story was scary or not scary. Stories were read aloud sentence by sentence, and after each sentence children were asked whether they thought that the story would be scary or not scary. Results indicated that children with high levels of social anxiety needed to hear fewer sentences before deciding a story to be threatening compared to children with low levels of social anxiety. The Muris *et al.* (in press) study further showed that socially anxious children more frequently perceived threat while listening to the stories, more often interpreted the stories as threatening, and displayed higher levels of negative feelings and cognitions in relation to these stories than control children.

Muris *et al.* (in press) found these threat perception abnormalities in relation to social anxiety. It remains to be seen whether these effects occur with other types of childhood anxiety such as separation anxiety or generalized anxiety. The present study addressed this issue. A group of 105 normal school children were exposed to three types of stories: social anxiety stories, separation anxiety stories, and generalized anxiety stories. Like in the Muris *et al.* (in press) study, children were instructed to find out as quickly as possible whether the pertinent story was scary or not scary. Children were also asked to give their interpretation of the story and to evaluate each story in terms of negative feelings and cognitions. It was expected that, compared to children with low levels of anxiety, children with high levels of anxiety more frequently perceive threat while listening to these stories, perceive higher levels of threat, need to hear fewer sentences of a story before deciding it to be scary, more frequently interpret the stories as threatening, and report more negative feelings and cognitions to the stories. An attempt was made to examine whether threat perception abnormalities are mediated by children's general level of anxiety or whether these aberrations are specific for the various types of anxiety disorders. In the first case, children's levels of trait anxiety would be related to threat perception abnormalities irrespective of the anxiety-specific content of the stories. In the second case, children's levels of specific anxiety symptoms would be associated with threat perception abnormalities as assessed by means of anxiety-specific stories. In this line of reasoning, children with high levels of social phobia symptoms would particularly display threat perception abnormalities in relation to social anxiety stories, children with high levels of separation anxiety symptoms would especially show these aberrations in separation anxiety stories, whereas children with high levels of generalized anxiety would most strongly evidence the aberrations in generalized anxiety stories.

METHOD

Children

The sample consisted of 105 children (36 boys and 69 girls) who were recruited from a primary school in Maastricht, The Netherlands. Mean age of the children was 10.5 years ($SD = 1.2$, range 8–13 years). Informed consent was obtained from parents and children before participation in the study; 89% of those invited to participate eventually did so.

In this sample, 29 children (27.6%) displayed subclinical symptoms (see below: Diagnostic interview) of one or more anxiety disorders: 18 children (17.1%) had one subclinical anxiety disorder, 4 children (3.8%) had two anxiety disorders, and 7 children (6.7%) had three anxiety disorders. The number (percentages) of children with subclinical symptoms of social phobia, separation anxiety disorder, and generalized anxiety disorder were 15 (14.3%), 22 (21.0%) and 10 (9.5%), respectively.

Nine children (8.6%) of the 29 “anxious” children met the full criteria for one of the three anxiety disorders: 8 of them (7.6%) had one anxiety disorder and 1 child (1.0%) suffered from all three anxiety disorders. There were 5 children (4.8%) with separation anxiety disorder, 4 children (3.8%) with generalized anxiety disorder and 2 children (1.9%) with social phobia.

Assessment

Questionnaires

The *Screen for Child Anxiety Related Emotional Disorders* (SCARED; Birmaher, Khetarpal, Brent *et al.*, 1997; Muris, Merckelbach, Schmidt, & Mayer, 1999a) is a 66-item self-report questionnaire measuring symptoms of the anxiety disorders that according to the Diagnostic and Statistical Manual of Mental Disorders (DSM; American Psychiatric Association, [APA], 1994) may occur in children. The SCARED contains nine anxiety disorder subscales, but for the purpose of the present study only the separation anxiety disorder (12 items, e.g., “I don’t like being away from my family”; $\alpha = 0.80$), generalized anxiety disorder (9 items, e.g., “I worry about things working out for me”; $\alpha = 0.84$), and social phobia (4 items, e.g., “I don’t like to be with unfamiliar people”; $\alpha = 0.64$) scales and the sum score of these three scales (i.e., total score; $\alpha = 0.92$) were used. Children are asked to rate the frequency with which they experience each anxiety symptom on a 3-point scale: 0 = *almost never*, 1 = *sometimes*, or

2 = *often*. SCARED total and subscale scores are derived by summing across relevant items.

Research has shown that the SCARED is a reliable questionnaire in terms of internal consistency (Muris *et al.*, 1999a) and test-retest stability (Muris, Merckelbach, Van Brakel, & Mayer, 1999b). Furthermore, support has been found for the validity of the scale. For example, SCARED scores correlate strongly with scores on traditional childhood anxiety measures (Muris, Merckelbach, Van Brakel, Mayer, & Van Dongen, 1998a; Muris, Merckelbach, Mayer *et al.*, 1998b) and there is evidence that the SCARED satisfactorily differentiates between anxiety disordered and depressed youths and between anxious and non-anxious children (Birmaher *et al.*, 1997; Birmaher, Brent, Chiappetta *et al.*, 1999; Muris, Merckelbach, Mayer, & Prins, 2000).

The trait version of the *State-Trait Anxiety Inventory for Children* (STAIC; Spielberger, Edwards, & Lushene, 1973; $\alpha = 0.91$) contains 20 items such as "I worry too much" and "I get a funny feeling in my stomach." Children have to rate these items on a 3-point scale: 1 = *almost never*, 2 = *sometimes*, or 3 = *often*. STAIC scores range between 20 and 60 with higher scores reflecting higher levels of trait anxiety.

The trait scale of the STAIC is a widely used measure of childhood anxiety that has high internal consistency and possesses reasonable test-retest stability (Spielberger *et al.*, 1973). Evidence for its validity has been obtained by Reynolds (1980) showing that the STAIC trait scale correlates substantially with an alternative measure of general anxiety, i.e., the Revised Children's Manifest Anxiety Scale (Reynolds & Richmond, 1978).

Stories

Nine audiotaped, hypothetical stories were used (see Appendix). There were three types of stories: social anxiety stories (e.g., going to a sporting club for the first time), separation anxiety stories (e.g., staying home alone over the night), and generalized anxiety stories (e.g., driving with your bike on a very busy street). Three child psychologists agreed 100% on judging each of the nine stories to be specific for one of the anxiety disorders.

Children received the following general instruction: "In a moment, you are going to listen to a number of brief stories. Some stories are scary: this means that these stories will have a bad end. Some stories are not scary: this means that these stories will have a good end. You have to try to guess *as quickly as possible* whether the story is a scary story which will have a bad end or a nonscary story which will have a good end. The stories are presented sentence by sentence and after each sentence I will ask you whether you think that the story is scary or non-scary".

Each story consisted of five sentences. After listening to each sentence, children were asked: "Is this going to be a scary or a non-scary story?". Two scores were derived from children's answers to this question. First, for each story, the *threshold of threat perception* was established. This threshold score was defined as the moment at which a child first began to perceive the story as scary. When a child indicated that the story was going to be scary after listening to the first sentence, the threshold score was 1, when a child indicated that the story was going to be scary after the second sentence, the threshold score was 2, etc. When a child still indicated that the story was going to be non-scary after listening to the fifth and final sentence, the threshold was scored as 6. Threshold scores were averaged for each type of stories. Second, for each type of stories, the number of sentences after which children indicated that the story was going to be threatening was summed to yield the *frequency of threat perception*.

After each sentence of the story, *threat ratings* were obtained. Each time the child indicated the story to be scary, he/she was asked to predict how threatening the story was going to be on a 10-point Likert scale (1 = *almost not*; 10 = *very much*). This threat rating was scored 0 in case children indicated the story as non-scary after hearing a sentence. For each story type, a mean threat rating score was calculated.

To measure *interpretation bias*, the story was presented to children for a second time without any interruptions. Children were asked: "What do you think will happen in this situation?" Children's answers were written down word-by-word, and then rated by two blind raters who judged whether children had interpreted the pertinent story as either threatening or non-threatening. Raters agreed in 90.2% of the judgements, resulting in a kappa of 0.80. For each type of stories, the number of stories that children interpreted as threatening was summed.

Finally, children were asked: "How would you feel if you were in this situation?" and rated the following feelings and cognitions scales: 1. I am scared, 2. I am shy, 3. I don't know what to do, 4. I am worried that this will end badly. Each scale had to be scored on a 5-point scale ranging from 1 = *not at all* to 5 = *very much*. Scores were summed for each story and then averaged for each type of stories. Cronbach's alphas of the feelings and cognitions scales for the various stories ranged between 0.74 and 0.86, with a mean alpha of 0.82.

Diagnostic Interview

The child version of the *Diagnostic Interview Schedule for Children* (DISC; National Institute of Mental Health, 1992) is a highly structured

lay-administered interview instrument designed to assess the more common DSM-III-R (APA, 1987) diagnoses of children and adolescents. Previous research has shown that the DISC possesses adequate test-retest reliability (Schwab-Stone *et al.*, 1993), sufficient interrater reliability (Shaffer *et al.*, 1993), and acceptable validity (Piacentini *et al.*, 1993). In the current study, the DISC was used to identify children with high levels of social phobia, separation anxiety disorder, and generalized anxiety disorder. Children who met the key criterion for an anxiety disorder and at least two additional criteria were defined as "children with subclinical anxiety disorders." The other children were defined as "control children." As an aside, it should be mentioned that the DSM-III-R criteria for the three anxiety disorders that were investigated in the present study are highly similar to the current diagnostic criteria as described in the latest edition of the DSM (i.e., the DSM-IV; American Psychiatric Association, 1994).

Procedure

Children completed SCARED and STAIC in their classrooms. A teacher and a research assistant were present to help the children if necessary and to ensure confidential and independent responding. About one month after the completion of the questionnaires, children were tested individually in a private room at school. The two research assistants (1 male and 1 female) who carried out the interviews were blind to children's questionnaire scores and experienced in interviewing children of this age. They first carried out the story interview and then administered the DISC. The stories were presented in a fixed alternating order (i.e., social phobia—separation anxiety—generalized anxiety). To control for order effects, each child started at a different point within this order.

RESULTS

General Results

Table I presents mean scores on indices of threat perception for each of the three story types and for all stories together. Two conclusions can be drawn from this table. First, scores on threat perception indices seem to indicate that, in general, stories were moderately threatening. More specifically, mean scores were 3.6 ($SD = 1.2$) for threat threshold (maximum = 6), 16.8 ($SD = 10.2$) for threat frequency (maximum = 45), 1.7 ($SD = 1.6$) for threat ratings (maximum = 10), 2.3 ($SD = 2.3$) for threat

Table 1. Mean Scores (Standard Deviations) on Indices of Threat Perception

	Range per story type	Range for all stories	Social anxiety stories	Separation anxiety stories	Generalized anxiety stories	All stories
Threat threshold*	1-6	1-6	3.6 (1.5)	3.8 (1.4)	3.5 (1.3)	3.6 (1.2)
Threat frequency	0-15	0-45	5.4 (3.8)	5.0 (3.7)	6.4 (3.8)	16.8 (10.2)
Threat ratings	0-10	0-10	1.5 (1.7)	1.6 (1.8)	1.8 (1.8)	1.7 (1.6)
Threat interpretation	0-3	0-9	0.8 (0.9)	0.7 (0.9)	0.8 (0.9)	2.3 (2.3)
Feelings and cognitions	4-20	4-20	7.6 (3.1)	7.6 (3.3)	7.4 (3.1)	7.5 (3.0)

Note. *High threat threshold scores are indicative for low levels of threat perception. For all other variables, higher scores reflect higher levels of threat perception.

interpretation (maximum = 9), and 7.5 ($SD = 3.0$) for feelings and cognitions (maximum = 20). Second, mean scores on threat perception indices (i.e., threat threshold, threat frequency, threat ratings, threat interpretation, and feelings and cognitions) were highly comparable for the three story types.

Correlations Between Anxiety Questionnaires and Indices of Threat Perception

Correlations between SCARED scales and STAIC, on the one hand, and indices of threat perception, on the other hand, are displayed in Table II. As previous studies have found that girls generally report higher levels of anxiety than boys and that anxiety and fear decline with increasing age (see for a review, Craske, 1997), these correlations were corrected for gender and age. Note that correlations showed the to-be-expected pattern. That is, positive correlations emerged between anxiety questionnaire scores and threat frequency, threat ratings, threat interpretation, and negative feelings and cognitions, while negative correlations emerged between anxiety scores and threat thresholds. Thus, high levels of SCARED anxiety disorder symptoms and trait anxiety were accompanied by a high frequency of threat perception, high ratings of threat, a high frequency of threatening interpretations, high levels of negative feelings and cognitions, and an early detection of threat.

Most importantly, the correlations in Table II provide no evidence for the notion that specific anxiety symptoms are associated with threat perception indices as assessed by means of anxiety-specific stories. A series of five stepwise regression analyses (with gender and age forced into the equation on step (1) showed that of the three SCARED anxiety scales, separation anxiety disorder was most strongly related to threat perception indices across all types of stories: in all analyses, this variable accounted for a significant proportion of the variance [R^2 s between 0.12 and 0.33, all $F(1,101)$ s > 15.0 , P s < 0.001] whereas SCARED social phobia and generalized anxiety disorder never entered the equation. Furthermore, correlations support the idea that children's general level of anxiety (i.e., SCARED total score and STAIC trait anxiety) was substantially associated with scores on threat perception measures.

DISC Subclinical Anxiety Disorders and Indices of Threat Perception

A correlational approach was used to examine the relationship between DISC anxiety disorders and indices of threat perception. As DISC

Table II. Correlations (While Controlling for Age and Gender) Between SCARED and STAIC Anxiety Scales, on the One Hand, and Indices of Threat Perception, on the Other Hand

	SCARED				STAIC trait anxiety
	Social phobia	Separation anxiety disorder	Generalized anxiety disorder	Total score	
Social anxiety stories					
Threat threshold	-0.23*	-0.32**	-0.27**	-0.33***	-0.34***
Threat frequency	0.27**	0.35***	0.31**	0.39***	0.35***
Threat ratings	0.29**	0.48***	0.38***	0.47***	0.42***
Threat interpretation	0.19	0.25*	0.25*	0.28**	0.30**
Feelings and cognitions	0.37***	0.50***	0.47***	0.54***	0.51***
Separation anxiety stories					
Threat threshold	-0.29**	-0.39***	-0.37***	-0.42***	-0.40***
Threat frequency	0.29**	0.43***	0.36***	0.46***	0.42***
Threat ratings	0.29**	0.54***	0.37***	0.50***	0.46***
Threat interpretation	0.28**	0.51***	0.51***	0.54***	0.55***
Feelings and cognitions	0.33***	0.58***	0.47***	0.57***	0.53***
Generalized anxiety stories					
Threat threshold	-0.15	-0.21*	-0.23*	-0.24*	-0.21*
Threat frequency	0.19	0.27**	0.29**	0.34***	0.29**
Threat ratings	0.28**	0.47***	0.39***	0.47***	0.42***
Threat interpretation	0.31**	0.30**	0.31**	0.35***	0.35***
Feelings and cognitions	0.29**	0.57***	0.46***	0.55***	0.50***
All stories					
Threat threshold	-0.26**	-0.35***	-0.33***	-0.38***	-0.36***
Threat frequency	0.28**	0.39***	0.35***	0.44***	0.39***
Threat ratings	0.31**	0.53***	0.41***	0.51***	0.46***
Threat interpretation	0.31**	0.42***	0.42***	0.46***	0.47***
Feelings and cognitions	0.35***	0.58***	0.49***	0.58***	0.54***

Notes. *N* = 105. SCARED = Screen for Child Anxiety Related Emotional Disorders, STAIC = State-Trait Anxiety Inventory for Children. **P* < 0.05, ***P* < 0.01, ****P* < 0.001. Target correlations between anxiety scales and threat perception indices are printed in bold.

diagnoses were dichotomous variables, point-biserial correlations were computed. As can be seen in Table III, correlations between DISC anxiety disorders and threat perception indices were of the same magnitude than those between SCARED scales and threat perception measures [statistical tests (McNemar, 1969) performed to compare the correlations revealed no significant differences]. Nevertheless, a highly similar pattern emerged. That is, positive correlations were found between DISC anxiety disorders and threat frequency, threat ratings, threat interpretation, and negative feelings and cognitions, whereas negative correlations emerged between anxiety disorders and threat thresholds. No support was found for the hypothesis that specific anxiety disorders were related to threat perception indices of anxiety-specific stories. In fact, results of stepwise regression analyses showed that the DISC diagnosis of separation anxiety disorder strongly

Table III. Correlations (While Controlling for Age and Gender) Between DISC Anxiety Diagnoses and Indices of Threat Perception

	DISC			
	Social phobia	Separation anxiety disorder	Generalized anxiety disorder	Any anxiety disorder
Social anxiety stories				
Threat threshold	−0.31**	−0.39***	−0.27**	−0.41***
Threat frequency	0.41***	0.40***	0.30**	0.42***
Threat ratings	0.51***	0.47***	0.38***	0.50***
Threat interpretation	0.29**	0.42***	0.26**	0.39***
Feelings and cognitions	0.55***	0.50**	0.45***	0.54***
Separation anxiety stories				
Threat threshold	−0.35***	−0.49***	−0.25*	−0.47***
Threat frequency	0.38***	0.53***	0.30**	0.50***
Threat ratings	0.47***	0.63***	0.40***	0.59***
Threat interpretation	0.37***	0.59***	0.38***	0.56***
Feelings and cognitions	0.52***	0.61***	0.50***	0.62***
Generalized anxiety stories				
Threat threshold	−0.28**	−0.33**	−0.19	−0.38***
Threat frequency	0.32**	0.43***	0.22*	0.44***
Threat ratings	0.44***	0.58***	0.39***	0.58***
Threat interpretation	0.21*	0.38***	0.20*	0.33**
Feelings and cognitions	0.46***	0.56***	0.45***	0.59***
All stories				
Threat threshold	−0.36***	−0.46***	−0.27**	−0.48***
Threat frequency	0.41***	0.50***	0.30**	0.50***
Threat ratings	0.51***	0.60***	0.42***	0.60***
Threat interpretation	0.34***	0.54***	0.33**	0.51***
Feelings and cognitions	0.54***	0.59***	0.49***	0.61***

Notes. *N* = 105. DISC = Diagnostic Interview Schedule for Children. Because DISC diagnoses were dichotomous variables, point-biserial correlations were computed. **P* < 0.05, ***P* < 0.01, ****P* < 0.001. Target correlations between DISC anxiety disorders and threat perception indices are printed in bold.

predicted scores on threat perception indices across various types of stories. In all equations, the DISC diagnosis of separation anxiety disorder declared a significant proportion of the variance [R^2 s between 0.21 and 0.35, all $F(1,101)$ s > 25.0 , P s < 0.001]. In the regression equations of threat ratings and feelings and cognitions, the diagnosis of social phobia accounted for some additional variance [R^2 s were respectively 0.07, $F(1,100) = 11.6$, $P < 0.005$ and 0.09, $F(1,100) = 15.8$, $P < 0.001$]. Furthermore, the diagnosis of any anxiety disorder substantially correlated with overall threat perception scores, suggesting a general anxiety effect rather than an anxiety-specific effect. This latter finding is illustrated in Table IV. A multivariate analysis of variance with gender and age as covariates (MANCOVA) confirmed that children with a subclinical anxiety disorder clearly displayed more threat perception abnormalities than children without a subclinical anxiety disorder [$F_{\text{hot}}(5,97) = 12.8$, $P < 0.001$, $\text{Eta}^2 = 0.40$]. Follow-up ANCOVAs indicated that this effect showed itself on all threat perception indices.

DISCUSSION

The current study examined the relationship between childhood anxiety and threat perception abnormalities. Children were exposed to stories reflecting three types of anxiety: social anxiety, separation anxiety, and generalized anxiety. From children's reactions to the stories, a number of threat perception indices were derived. Children's level of anxiety was assessed by means of questionnaires (SCARED and STAIC) and a diagnostic interview (DISC). The main results can be catalogued as follows. First, high levels of anxiety, as measured by questionnaires and interview, were accompanied by a high frequency of threat perception, high ratings of

Table IV. Mean Overall Scores (Standard Deviations) on Threat Perception Indices for Children With and Without a Subclinical Anxiety Disorder

	No anxiety disorder ($n = 76$)	Anxiety disorder ($n = 29$)	F^*	P	Eta^2
Threat threshold	4.0 (1.1)	2.7 (1.0)	30.1	<0.001	0.23
Threat frequency	13.7 (8.5)	25.0 (10.0)	33.4	<0.001	0.25
Threat ratings	1.1 (0.9)	3.2 (2.1)	55.3	<0.001	0.35
Threat interpretation	1.6 (1.7)	4.2 (2.7)	34.7	<0.001	0.26
Feelings and cognitions	6.4 (1.7)	10.5 (3.6)	61.1	<0.001	0.38

Notes. Subclinical anxiety disorders were assessed by means of the Diagnostic Interview Schedule for Children. * F -values were obtained with follow-up ANCOVAs. Eta^2 is an index of effect size.

threat, a high frequency of threatening interpretations, high levels of negative feelings and cognitions, and an early detection of threat. Second, no evidence was obtained for the content-specific hypothesis, that is, threat perception abnormalities were specific for the various types of anxiety disorders. Third, separation anxiety disorder (as measured by SCARED and DISC) appeared to be most strongly connected to scores on threat perception indices irrespective of the anxiety-specific content of the stories. Fourth and finally, trait anxiety, SCARED total score, and the DISC diagnosis of any anxiety disorder were substantially connected to threat perception indices. This latter finding supports the notion that threat perception abnormalities are predominantly mediated by children's general level of anxiety.

It is important to note that the threat perception abnormalities as documented in the current study should not be considered as the *cause* of anxiety problems in children. Rather they should be seen as an epiphenomenon of high levels of anxiety that make children even more sensitive to (potentially) threatening events. Thus, it seems plausible that these threat perception abnormalities play a role in the continuation of anxiety complaints in children.

The finding that threat perception aberrations seemed to be strongly predicted by general levels of anxiety (SCARED total score, trait anxiety, any DISC anxiety diagnosis) rather than by specific anxiety disorder symptoms, deserves some further comment. It is a well-known fact that comorbidity among anxiety disorders is high and that social phobia, separation anxiety disorder, and generalized anxiety disorder frequently are co-occurring conditions (see for a brief review on this topic, Costello & Angold, 1995). In the present study, this comorbidity manifested itself in the substantial correlations between social phobia, separation anxiety disorders, and generalized anxiety disorder scales of the SCARED [with $r(105)$ s between 0.47 and 0.70, $P < 0.001$] and in the finding that 37.9% of the 29 "anxious" children had comorbid (subclinical) anxiety disorders. It is clear that the comorbidity between the three anxiety disorders worked against the detection of threat perception abnormalities related to the specific anxiety disorders. On the other hand, it should be mentioned that content-specific effects were also absent in children with only one (subclinical) DISC anxiety disorder. Another explanation for the absence of anxiety disorder-specific effects on some of the threat perception indices (i.e., threat frequency, threat ratings, and threat threshold) has to do with the stories that were used in the present study. Although these stories in whole were rated by clinical child psychologists as being highly specific for one of the three anxiety disorders, it should be noted that separate sentences of the stories could be relevant for various anxiety disorders. For example, the sentence

"You have decided to join a sporting club" not only elicits threat in socially anxious children but also in children with high levels of separation anxiety or generalized anxiety. In other words, it seems to be the case that stories in whole were specific while elements of stories were not.

Trait anxiety is considered as a personality characteristic that is involved in the perception of threat. For example, it has been noted that "persons high in trait anxiety have a greater tendency to perceive situations as dangerous or threatening than persons low in trait anxiety" (Kendall, 1978; p. 280). The present result that trait anxiety appeared to be a reliable predictor of threat perception abnormalities is well in line with this notion. The finding that separation anxiety substantially correlated with scores on threat perception indices of all stories is, on first sight, somewhat surprising. However, a review by Moreau and Follett (1993) concluded that separation anxiety in children is a nonspecific precursor of a variety of psychiatric conditions including any anxiety disorder and depression. This has led some authors to discuss separation anxiety as a risk factor which may be an alternative manifestation of neuroticism (see Craske, 1997).

Several shortcomings of the current study should be acknowledged. First, the study relied on a relatively small sample of normal children and certainly calls for replication in a clinical setting with anxiety disordered children. In particular, the employment of clinically anxious children who only meet the criteria for one of the three anxiety disorders would enable us to further investigate anxiety-specific threat perception abnormalities. Second, the two research assistants first administered the stories and then carried out the diagnostic interview. One could argue that children's reactions to the stories influenced the research assistants' assessment of DISC anxiety disorders. However, this is not very likely given the fact that the DISC interview is highly structured leaving no room for interpretation from the side of the interviewer. Furthermore, it is important to note that the correlations between SCARED anxiety disorders scores, which had been obtained one month before the interview session and to which the interviewers were blind, and threat perception measures revealed a highly similar pattern of results.

The present results replicate those of previous studies on information processing abnormalities in anxious children. More precisely, the study provides further evidence for the phenomena of interpretation bias which refers to anxious children's tendency to interpret ambiguous situations as threatening (Barrett *et al.*, 1996; Chorpita *et al.*, 1996; Hadwin *et al.*, 1997; Bögels & Zigterman, in press), and threat perception bias which reflects anxious children's propensity to decide more quickly that a situation is threatening (Muris *et al.*, in press). Both phenomena are likely to play a role in the maintenance of anxiety disorders symptoms in children, and

hence are relevant targets for treatment. From this point of view, cognitive-behavioral therapy (CBT) seems to be an appropriate treatment method. During CBT, children are encouraged to restructure anxiety-promoting cognitions (i.e., threatening interpretations) and to search for additional information before deciding a situation to be threatening.

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APPENDIX. EXAMPLES OF STORIES THAT WERE USED IN THE CURRENT STUDY

Social Anxiety

1. You come home from school and in the hall you hear voices of people that you don’t know.
2. Your mother calls you in.
3. An unknown man and woman are sitting in the living room.
4. Your mother introduces you to these people.
5. Mother fetches coffee in the kitchen and you stay in the room with this unknown man and woman.

Separation Anxiety

1. Your parents have tickets for the movies. The film that they want to see is shown this evening.

2. They decide to go and try to arrange a child-minder.
3. However, nobody is available and you hear your parents conferring about what to do.
4. Your parents say to you: "You are old enough to stay home alone over the night."
5. Your parents bring you to bed and say: "Sleep well, see you tomorrow!"

Generalized Anxiety

1. You ride on the bike slowly because you are carrying a large bag with purchases.
2. You ride on a street without a bikeway.
3. It is a very busy street.
4. The cars that pass you drive very fast.
5. Behind you, you hear a big truck approaching.